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EXAMINER

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/594,966
Filing Date: September 29, 2006
Appellant(s): IGNATYEV ET AL.

Merck Patent GmbH
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed November 10, 2009 appealing from the Office action mailed May 12, 2009.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

Zhou et al., Journal of Fluorine Chemistry, 2004, pp. 471-476

MacFarlane et al., Chem. Comm., 2001, pp. 1430-1431

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1, 3, 7 and 8 rejected under 35 U.S.C. 103(a) as being obvious over Zhou et al. (Journal of Fluorine Chemistry, 2004, p. 471-476) in view of MacFarlane et al. (Chem. Commun., 2001, 1430-1431).

Determination of the scope and contents of prior art.

Applicant's elected species is N-butyl-N-methylpyrrolidinium pentafluoroethyltrifluoroborate.

Zhou et al. teach 1-ethyl-3-methylimidazolium pentafluoroethyltrifluoroborate as an ionic liquid.

MacFarlane et al. teach a family of ionic liquids based on organic salts of the dicyanamide anion. The organic cation is generically taught to be quaternary

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ammonium, N-alkyl-N-methylpyrrolidinium, or 1-alkyl-3-methylimidazolium. 1-ethyl-3-methylimidazolium dicyanamide and N-butyl-N-methylpyrrolidinium dicyanamide are preferred embodiments. The disclosed salts have similar thermal behavior such as melting point, viscosity, water miscibility, etc. (see Table 1) which render them ionic liquids with similar properties.

Ascertaining the differences between prior art and instant claims.

The difference between the disclosure of Zhou et al. and the instantly elected species is the nature of the cation: ie. 1-ethyl-3-methylimidazolium (Zhou et al.) vs. N-butyl-N-methylpyrrolidinium (instant election).

Resolving the level of ordinary skill in the pertinent art – Prima Facie Case of Obviousness.

The disclosure of MacFarlane et al. establish a functional equivalence between 1-ethyl-3-methylimidazolium and N-butyl-N-methylpyrrolidinium as organic cations. Thus, the combined disclosure of Zhou et al. and MacFarlane et al suggests to one of ordinary skill to make N-butyl-N-methylpyrrolidinium pentafluoroethyltrifluoroborate. One of ordinary skill would be motivated to practice this instant election, with reasonable expectation of success, for the purpose of making an additional ionic liquid.

Thus, the instant invention is *prima facie* obvious over the teaching of the prior art.

(10) Response to Argument

Applicants arguments from the appeal brief filed on November 10, 2009 have been copied below, Sections a-c. The copied arguments are enclosed in quotations. The responses to Applicant's arguments are provided in bullet points in each of Sections a-c.

a) “ In addition to the absence of a close structural similarity, a strong factor suggesting that no presumption of prima facie obviousness exists, one of ordinary skill in the art has absolutely no basis to predict whether the diverse compounds would retain or lose desirable properties with such a significant structural modification to the cation. ”

- The reference of Zhou et al. teaches an ionic liquid wherein (cation = 1-ethyl-3-methylimidazolium) and (anion = pentafluoroethyltrifluoroborate).

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- The prior art reference of MacFarlane et al. teaches an **equivalence** of (cation = 1-ethyl-3-methylimidazolium) and (cation = N-butyl-N-methyl pyrrolidinium) for the instant utility of ionic liquids.
- Notwithstanding an absence of close structural similarity between (cation = 1-ethyl-3-methylimidazolium) and (cation = N-butyl-N-methyl pyrrolidinium), based on an art recognized equivalence of these cations, one of ordinary skill would be motivated to pair (cation = N-butyl-N-methyl pyrrolidinium) with (anion = pentafluoroethyltrifluoroborate), thereby producing the instantly claimed ionic liquid.
- The rationale above was presented in the office action dated February 26, 2008 (pg. 5), see excerpts below:

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Determination of the scope and contents of prior art.

Zhou et al. teaches 1-ethyl-3-methylimidazolium pentafluoroethyltrifluoroborate as an ionic liquid.

MacFarlane et al. teach a family of ionic liquids based on organic salts of the dicyanamide anion. The organic cation is generically taught to be quaternary ammonium, N-alkyl-N-methylpyrrolidinium, or 1-alkyl-3-methylimidazolium. 1-ethyl-3-methylimidazolium dicyanamide and N-butyl-N-methylpyrrolidinium dicyanamide are preferred embodiments. The disclosed salts have similar thermal behavior such as melting point, viscosity, water miscibility, etc. (see Table 1) which render them ionic liquids with similar properties.

Ascertaining the differences between prior art and instant claims.

The difference between the disclosure of Zhou et al. and the instantly elected species is the nature of the cation: i.e. 1-ethyl-3-methylimidazolium (Zhou et al.) vs. N-butyl-N-methylpyrrolidinium (instant election).

Resolving the level of ordinary skill in the pertinent art. Prima Facie Case of Obviousness.

The disclosure of MacFarlane et al. establish a functional equivalence between 1-ethyl-3-methylimidazolium and N-butyl-N-methylpyrrolidinium as organic cations. Thus, the combined disclosure of Zhou et al. and MacFarlane et al suggests to one of ordinary skill to make N-butyl-N-methylpyrrolidinium pentafluoroethyltrifluoroborate. One of ordinary skill would be motivated to practice this instant election, with reasonable expectation of success, for the purpose of making an additional ionic liquid.

- b) “ A reasonable expectation of success is not provided by the secondary reference. MacFarlane merely compares imidazolium dicyanamides and pyrrolidinium dicyanamides with respect to their viscosity. The article teaches that 1-ethyl-3-methylimidazolium dca has a viscosity of 21 cP in comparison to N-butyl-N-methylpyrrolidinium dca with 50 cP. This comparison provides no motivation for one of ordinary skill in the art to substitute imidazolium with pyrrolidinium compounds in the primary reference, since viscosity is not alone a determining factor in how the cations might perform as an ionic liquid. ”
- A reasonable expectation of success, although not explicit in the prior art reference, is based on an art recognized equivalence between (cation = 1-ethyl-3-methylimidazolium) and (cation = N-butyl-N-methyl pyrrolidinium). These two cations are both paired with (anion = dicyanamide) to form ionic liquids.
 - One of ordinary skill would have a reasonable expectation of producing an ionic liquid by pairing a known ionic liquid anion (ie. anion =

pentafluoroethyltrifluoroborate) with a known ionic liquid cation (ie. cation = N-butyl-N-methyl pyrrolidinium).

- c) “ the presently claimed compounds are submitted to possess unexpectedly advantageous properties, which clearly eliminate any prima facie case of obviousness. It was clearly not predictable that the electrochemical window of pyrrolidinium pentafluoroethyltrifluoroborate (-3 to +4 as seen from Fig 1 of the present application) would be larger than the disclosed electrochemical window of 1-ethyl-3-methylimidazolium pentafluoroethyl trifluoroborate (-2.5 to + 2.5; Fig. 4 of Zhou et al., page 474).

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attention is directed to the reference of VanSchalkwijk, supplied with Appellants' Reply of July 10 2009. VanSchalkwijk explains how, in molten salts used in lithium ion and related battery systems, possession of good electrochemical stability is necessary for adequate properties in a battery.

.....

the specification clearly indicates that electrochemical stability is important for ionic liquids ”

- The arguments above note a significantly larger electrochemical window for the instant elected species vs. that of the prior art ionic liquid of 1-ethyl-3-methylimidazolium pentafluoroethyl trifluoroborate.
- The quoted unexpected property is an advantage to production of battery systems, which is a different utility than the instant utility of ionic liquids.
- The quoted section of the specification does not link electrochemical stability as a parameter to evaluate ionic liquids. Applicant's referenced section of the specification is provided below:

Compounds of the formula Ia are distinguished, in particular, by their high electrochemical stability. This is confirmed by the cyclic voltamogram

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The specification states that the claimed compounds have high electrochemical stability. The specification does not state that this property is a parameter by which ionic liquids can be evaluated.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Sun Jae Y. Loewe/

Conferees:

/Joseph K. McKane/

Supervisory Patent Examiner, Art Unit 1626

/James O. Wilson/

Supervisory Patent Examiner, Art Unit 1624